capital, longer experience, more extensive colonial trade, and larger commercial relations with every nation of the world.

"It is impossible to escape from the conclusion, that, if we are behind the Americans the fault is entirely ours, and the superiority must be attributed either to the greater knowledge, intelligence, adroitness, or ability of the Americans, or to ignorance, prejudice, or supineness on our own part.

"If I then succeeded in satisfying you, that it would not be wise any longer to assert our hereditary superiority by *words* merely; if I led you to do more justice than we have hitherto done to our younger brother over the water; if I led you to believe it was just possible that our younger brother, with some faults, was less prejudiced and more active than we have hitherto been willing to give him credit for, and that it is just possible that Old Britannia, rich, indolent, and shutting her eyes, might have inadvertently let the sceptre of the waves drop from her fingers; then I accomplished all I hoped for. To be well assured that we are *not first* is, I hope, enough with Englishmen to secure that we *shall be*.

"To-night I shall endeavour to go more fully into the question, *How?* How shall we now, rapidly and surely, make progress in navigation and naval construction?

"If I may venture to state any single source to which I should look for the advancement of naval construction in this country, I should say it was from the general increase of knowledge of the true principles and theory of ship-building among all the classes of society who are connected with the naval and shipping interest of this country.

"This may appear to be a common-place remark; and it may sound like a truism, to say that we should all do better if we knew better. But the diffusion of knowledge of the kind I mean, among the classes I refer to, is really more practically valuable than does superficially appear. In this country there is a vast number of persons, and a great variety of interests, concerned in the construction of every ship.—First, there is the Legislature who make Acts of Parliament for ship-building;—Then there is "Lloyd's" who make rules and regulations for ship-building, and who give the certain rank and classification according to their own notions of what a ship should be;—Then there are the Insurance Brokers who insure a ship at a larger or a smaller premium, according to their rules for the security of a ship and the property she contains;—Then there come the Proprietors of Harbours and Docks who charge tonnage-dues according to certain registers and laws; and Boards who regulate pilotage and make other nautical laws according to their own notions and principles;—Next comes the Ship-Owner or Merchant, who orders the ship from the ship-builder and holds the purse-strings; and he too, who never sailed a ship in his life, he too has his notions right or wrong, not only of what his ship ought to be, but of how he ought to have her constructed: he virtually dictates to the

Builder the radical points of construction, which compel him to make a bad ship, or at least deprive him of the elements of a good one:— Then comes a more important man, even than the ship-builder or the owner,—the Captain who is to sail the new ship, who has sailed the preceding ship, who may have no notion how the ship is formed, and yet may have prejudices as strong, and notions as obstinate, as if his will were a law of nature, and his notions truths in hydraulics; Then there is the Lumper who stows your ship by contract, and your Mast-maker who puts in his spars, and the Sail-cutter who cuts your sails, and the Rigger who places ropes and blocks; all done by each contractor, and by every one under him according to the rules of his trade. Among all these gentlemen, let me ask you, if they are ignorant and prejudiced, what is to be expected from the poor ship-builder?—and the poor ship?—To improve British navigation we must improve the state of knowledge of all these classes, and by that means alone can extensive improvement take place in the Naval constructions of England."

The Lecturer then explained, and illustrated by diagrams, the various points in the construction of a ship which give her peculiar qualities, dividing the examination of a ship into three categories:

1st, The Geometry of Naval Construction, viz.:—
  The Midship Section.
  The Body Plan.
  The Sheer Plan.
  The Water Lines.
  The Ribband Lines.
  The Buttock Lines.

2nd, The Mechanical Qualities of Ships:
  Weight.
  Displacement.
  Stability—Statical and Dynamical.
  Easiness in Rolling and Pitching.
  Dryness.
  Weatherliness.
  Handiness in Working.

3rd, Equipment and Stowage of Ships, as affecting their qualities:
  Trim.
  Stowage.
  Centre of Weight.
  Centre of Oscillation.
  Sails.
  Masts.
  Number of Men.
  Economy of Working.

In regard to these three classes of elements, it was shewn that all must be combined with a perfect understanding of the effect of each on the others, to make a good performance; otherwise, by bad equipment, bad stowage, or ignorant handling, a good plan might result in a bad ship; or a good ship, stowed and equipped without knowledge of her form and qualities, might be rendered in practice a sorry performer. The elevation of all classes connected with shipping, in general intelligence on all the points that approach a ship's performance, is the only sure means of advancing our naval position among other nations.

[J. S. R.]

In the Library were exhibited: —

Dr. Junod's Exhausting Apparatus. [Exhibited by Dr. Junod.]

Casts of Eggs of Æpyornis Maximus, Madagascar; Birds mounted by Mr. A. D. Bartlett.

Starling and Blackbird, — Imitation (in Leather) of Wood Carving, by Mr. Sanders.

Flexible Chain cast in one Piece by Messrs. Midworth, Newark. [Exhibited by Mr. Duer.]

Chinese, Burmese, and Malay Swords, — Chinese Tea-pot — Old Dutch carving, "Adam and Eve expelled from Paradise." [Exhibited by Dr. W. V. Pettigrew, M.R.I.]

Vases in Parian China, — Marble Cross inlaid, — Stag and Buffalo in Cast-iron, — Ortheroceratite and Section — Cast of Helmet from one in Silver in the Paris Museum. [Exhibited by Mr. Tennant.]

A Daguerrotype Portrait of Sir John Herschell. [Exhibited by Major Jervis, M.R.I.]

Roman Bronze Antiquities. [Exhibited by W. Chaffers, Esq., F.S.A.]

Ibbetson's Geometric Chuck for producing Bi-cycloid Curves. [Exhibited by Mr. Perigal.]

Portrait of Erasmus Wilson, Esq., by Miss Jane C. Bell.

Mr. C. Varley exhibited various Animalcules, by the Microscope.

GENERAL MONTHLY MEETING,

Monday, June 7.

William Pole, Esq., M.A., F.R.S., Treasurer and Vice-President, in the Chair.

Wentworth William Buller, Esq.
A. S. Oliver Massey, Esq.
Richard Jennings, Esq.

were *admitted* Members of the Royal Institution.

Charles Blakely Brown, M.D.
John Peter Fearon, Esq.
Edward M. Foxhall, Esq.
Robert M'Calmont, Esq.
Miss Harriet Moore.
David Oldfield, Esq.

were duly *elected* Members of the Royal Institution.

A Letter was read from W. T. Brande, Esq. expressing his deep sense of the distinction conferred on him by his election as Honorary Professor of Chemistry in the Royal Institution.

The following Presents were announced; and the thanks of the Members returned for the same:—

From

Anderson, W. J. Esq., F. R. C. S., M. R. I. (the Author)—The Symptoms and Treatment of the Diseases of Pregnancy. 12mo. 1852.

Alessandro, Sella, da Torino (the Author)—Una Visita all' Abendberg, 10 Sett^{e}. 1850. 8vo.

Asiatic Society of Bengal—Journal, No. 225. 8vo. 1852.

Astronomical Society (Royal)—Monthly Notices, Vol. XII. No. 5. 8vo. 1852.

Bell, Jacob, Esq. (the Editor)—The Pharmaceutical Journal for May, 1852. 8vo.

British Architects (Royal Institute of)—Proceedings, May, 1852. 4to.

Civil Engineers (Institution of)—Proceedings, May, 1852. 8vo.

D. C. L. (the Author)—Letters on Church Matters. Vol. III. 8vo. 1852.

East India Company, The Hon.—Meteorological Observations made at the Magnetical Observatory, Singapore, by Capt. C. M. Elliott, in 1841-45. 4to. 1850.

Editor—The Athenæum for April, 1852. 4to.
The Medical Circular for May, 1852. 4to.

Esdaile, James, M.D. (the Author)—The Introduction of Mesmerism as an Anæsthetic and Curative Agent into the Hospitals of India. 8vo. 1852.

Faraday, Professor—Geschichtliche Darstellung des Galvanismus von O. E. J. Seyffer, Ph. D. 8vo. 1848.
Traité des Phénomènes Electro-Physiologiques des Animaux, par C. Matteucci suivi d'Etudes Anatomiques sur le Système Nerveux et sur l'Organe Electrique de la Torpille; par Paul Savi. 8vo. Paris, 1844.

Revision der Lehre vom Galvano-Voltaismus. Von C. H. Pfaff. 8vo. Altona. 1837.
Essai Historique sur les Phénomènes et les Doctrines d'Electro-Chimie, par E. F. Wartmann. 8vo. Genève, 1838.
Théorie Physique et Mathématique des Phénomènes Electro-dynamiques et du Magnétisme, par A. Masson. 8vo. Paris, 1838.
Das Verhalten des Eisens zum Sauerstoff, von L. F. Schönbein. 8vo. Basel, 1837.
Verhandeling over de Gutta Percha en Caoutchouc. Door A. Adriani. 8vo. Utrecht, 1850.
Recherches sur l'emploi de divers Amendements dans la Culture des Forêts, par M. E. Chevandier. 8vo. Paris, 1852.
Materials for a Fauna and Flora of Swansea and the Neighbourhood, by L. W. Dillwyn, F. R. S. 8vo. 1848.
Meditationes Analyticæ, by W. Spottiswoode. Part 1-5. 4to. 1837.
Monatsbericht der Königl. Preuss. Akademie, März, 1852. 8vo.

Franklin Institute, Philadelphia — Journal, Vol. XIII. No. 2, 3, 4. 8vo. 1852.

Geological Society,— Journal, No. 30. 8vo. 1852.
Anniversary Address, by W. Hopkins, Esq. 8vo. 1852.

Kerr, (Mrs. Alexander) M.R.I. — Code of Bugis Maritime Laws, with a Translation, Vocabulary, &c. 12mo. Singapore. 1832.

Loseby, Mr. (the Author) — Improvements in Timekeepers. 12mo. 1852.

Lovell, E. B. Esq. (the Editor) — The Monthly Digest for May, 1852. 8vo.

Mantell, G. A. Esq., LL.D., F.R.S. (the Author) — On the Fossil Remains of Reptiles, &c., from the Devonian Strata of Morayshire, &c. 8vo. 1852.

Royal Society of London — Transactions for 1851, Part II. 4to. 1852.
Proceedings, No. 76. 8vo. 1852.

Rowcroft, Charles, Esq. (the Author) — Confessions of an Etonian. 3 vols. 16mo. 1852.

Scoffern, John, M. B. (the Editor) — The Chemical Record for May, 1852. 4to.

Sharp, Granville, Esq. (the Author) — The Prize Essay on the Application of Recent Inventions collected at the Great Exhibition of 1851, to the purposes of Banking. 8vo. 1852.

Vereins zur Beförderung des Gewerbfleisses in Preussen — Verhandlungen, Jan. und Feb. 1852. 4to.

Wilkinson, Sir J. Gardner, F. R. S. (the Author) — The Fragments of the Hieratic Papyrus at Turin: containing the Names of the Egyptian Kings with the Hieratic Inscription at the back. Folio and 8vo. 1851.

Weale, John, Esq. — Rudimentary Treatises: 12mo. 1852.
The Marine Engine, &c. by R. Murray, C. E.
Astronomy, by the Rev. R. Main.
Integral Calculus, by H. Cox, B. A.
Differential Calculus, by W. S. B. Woolhouse, Esq.
Agricultural Engineering; Vol. I. Buildings; by G. H. Andrew.
Magnetism, Part III. by Sir W. Snow Harris, F.R.S.
Statics and Dynamics, by T. Baker, C. E.
Embanking, by John Wiggins, F. G. S.

Zoological Society of London — Transactions, Vol. IV. Part 2. 4to. 1852.

Catherwood, Frederick, Esq.—A Large Specimen of Auriferous Quartz from Gold Hill, Grass Valley, Nevada County, California.

WEEKLY EVENING MEETING,

Friday, June 11.

42.

Sir Charles Fellows, Vice-President, in the Chair.

Professor Faraday,

On the Physical Lines of Magnetic Force.

On a former occasion, (Jan. 23, 1852, see p. 105) certain lines about a bar magnet were described and defined (being those which are depicted to the eye by the use of iron filings sprinkled in the neighbourhood of the magnet), and were recommended as expressing accurately the nature, condition, direction, and amount of the force in any given region either within or outside of the bar. At that time the lines were considered in the abstract. Without departing from or unsettling any thing then said, the enquiry is now entered upon of the possible and probable *physical existence* of such lines. Those who wish to reconsider the different points belonging to these parts of magnetic science may refer to two papers in the first part of the Phil. Trans. for 1852 for data concerning the *representative* lines of force, and to a paper in the Phil. Mag. 4th Series, 1852, vol. iii. p. 401, for the argument respecting the *physical* lines of force.

Many powers act manifestly at a distance; their physical nature is incomprehensible to us: still we may learn much that is real and positive about them, and amongst other things something of the condition of the space between the body acting and that acted upon, or between the two mutually acting bodies. Such forces are presented to us by the phenomena of gravity, light, electricity, magnetism, &c. These when examined will be found to present remarkable differences in relation to their respective lines of forces; and at the same time that they establish the existence of real physical lines in some cases, will facilitate the consideration of the question as applied especially to magnetism.

When two bodies, *a*, *b*, gravitate towards each other, the line in which they act is a straight line, for such is the line which either would follow if free to move. The attractive force is not altered, either in *direction* or *amount*, if a third body is made to act by gravitation or otherwise upon either or both of the two first. A balanced cylinder of brass gravitates to the earth with a weight exactly the same, whether it is left like a pendulum freely to hang towards it, or whether it is drawn aside by other attractions or by tension, whatever the amount of the latter may be. A new gravitating force may be exerted upon *a*, but that does not in the least affect the amount of power which it exerts towards *b*. We have no evidence that *time*